Radiolabeled Antigranulocyte Antibodies in Clinical Practice
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Imaging of inflammation and infection is a broad field of nuclear medicine diagnostics. Many radiotracers are approved for the multitude of possible pathogenetic reasons and all of them show several advantages and disadvantages compared to others in special clinical questions. Gallium-67, for example, is excellent for the early detection of pulmonary infection especially in HIV-positive patients [1]. Moreover, both Gallium-67 and F18-FDG are the only tracer showing a positive enhancement in case of osteomyelitis of the vertebral column. Indium-111-labeling of white blood cells is the method of choice for the diagnosis of renoparenchymal infection [2] or for differentiation between an intracerebral tumor and an abscess [3]. However, Ga-67 and WBC imaging share the disadvantage of a high whole-body radiation load of 10 to 22 mSv. A significant lower radiation burden is achieved if Tc-99m-labeled tracer are used. With Tc-99m-HMPAO-labeled white cells, an intraabdominal abscess or chronic inflammatory bowel disease may be localized after 2-4 hrs with a sensitivity of 95% [2]. Tc-99m-nanocolloide and Tc-99m-labeled unspecific human immunoglobulin (HIG) are in part enriched in an inflammatory focus due to unspecific extravasation out of the highly permeable capillaries. Therefor, false positive findings with a diffuse tracer enhancement may be exerted shortly after surgery because of an elevated vascular permeability [2].

A more specific approach is achieved with Tc-99m-labeled anti-granulocyte antibodies. There are two possible tracer – one whole antibody (BW250/183), binding to the granulocyte adhesion molecule NCA-95 and one antibody Fab’-fragment (Sulesomab), recognizing the NCA-90. Both antibodies show a high bone marrow uptake of 43-55% due to the labeling of granulocyte precursor cells. Approximately 20-30% are found in the vascular compartment, partly bound to granulocytes and partly as an unbound perfusion tracer [4]. Thus, apart from specific enhancement on sites of local granulocyte accumulation, an extravascular leakage is additionally responsible for local tracer accumulation in an inflammatory focus. The whole-body radiation load is calculated with appr. 8 mSv, similar to the value obtained with Tc-99m-HMPAO labeled WBC.

Values of 88% sensitivity and 75% specificity were reported by Becker et al 1994 [5] and 93% / 89% by Hakki et al. in 1997 [6] in studies consisting of preselected patients who have had several clear signs of osteomyelitis, sometimes even a positive bone scan. However, local granulocyte accumulation and increased perfusion may occur in areas of tissue remodelling leading to false positive results. False negative findings may arise from the predominance of macrophages and lymphocytes in chronic osteomyelitis, impaired perfusion inside an abscess or due to a high intravertebral pressure in case of spondylodiscitis [7].

In this lecture, the pathophysiological background and many examples of Antigranulocyte Immunoscintigraphy are presented in a variety of clinical settings and both the different indications and some pitfalls are discussed in detail.
References: